

# Optically functional ceramic materials

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Ji-Guang Li

Functional Powder and Advanced Ceramics Field / Field-Assisted Sintering Group

LI.Jiguang@nims.go.jp | [https://samurai.nims.go.jp/profiles/li\\_jiguang](https://samurai.nims.go.jp/profiles/li_jiguang)



## Background

- Phosphors and transparent ceramics are being widely used for LED lighting, solid lasers, and scintillators
- YAG and  $Y_2O_3$  based ceramics are well known, but there are still strong needs in the development of new materials and better fabrication technologies.

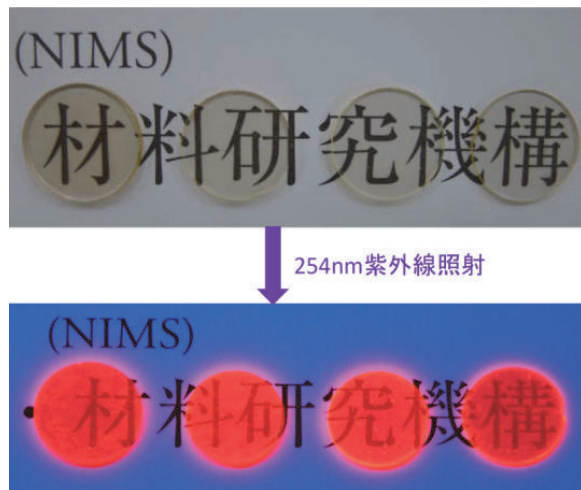
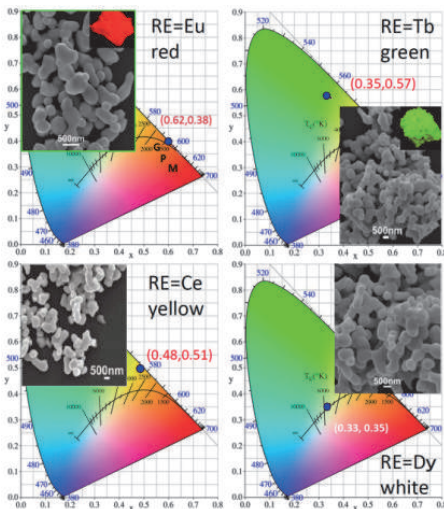
## Aim

- Development of GdAG-based solid solutions as efficient phosphors
- Fabrication of single-crystal-like  $(Y,Gd)_2O_3:RE$  (RE=Eu, Tb etc) transparent ceramics via advanced powder processing and vacuum sintering;
- Seeking enhanced luminescence with the energy transfer from  $Gd^{3+}$  to the activator

## Advanced Research Topics

$(Gd,M)AG:RE$  phosphors (M : for lattice stabilization); Synthesis: 1150-1500°C

$(Y,Gd)_2O_3:Eu$  transparent ceramics sintered at 1700°C for 4h (1mm thick; in-line transmittance ~81%)



## Publications

- J.-G. Li, Y. Sakka, *Science and Technology of Advanced Materials*, 2015, 16, 014902.
- B. Lu, J.-G. Li, Y. Sakka, *et al.*, *Journal of the American Ceramic Society*, 2015, 98[5], 1413-1422.
- B. Lu, J.-G. Li, Y. Sakka, *et al.*, *Journal of the American Ceramic Society*, 2015, 98[8], 2480-2487.

## Summary

- GdAG-based new phosphors
- Advanced processing technologies for highly sinterable oxide powders
- Single-crystal like transparent ceramics
- Excellent luminescent performances

## Research outcome

- Phosphors for scintillation and LED lighting
- Ceramic scintillators for X-CT etc.
- High temperature window, IR window, and solid laser materials